Lithium isotope ratios of waters and sediments of Lake Bangong, Western Tibetan Plateau

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We report lithium isotope ratios and abundances of surface waters and limnic, fluvial and terrestrial sediments from the catchment of Lake Bangong, western Tibetan Plateau. Today the lake consists of several basins or a chain of connected lakes with no drain. The dry climate and high altitude forms a cold desert environment in the catchment, which is mainly drained by three rivers.

The rivers and streams transport predominantly Ca-Mg-HCO_3 waters reflecting carbonate-rich rock sequences. The lake basins are filled with water, which has been altered by evaporation and precipitation of calcite and/or Mg-calcite. The northern inflow displays δ^7Li values between +5.1 to +6.1 (L-SVEC). The southern inflow averages at δ^7Li values around +9 but a wide range between +8.1 and +18.2 exists in its tributaries. The water contribution from the eastern catchment exhibits at tight range between +6.8 and +7.4 ‰. Lithium abundances vary from 100 to 300 µg/l. The δ^7Li of water from the main basin averages at +8.0 ‰. The samples from the smaller basins give higher δ^7Li values from +10.0 to +11.1 ‰. Fluvial and limnic sediments range from -4.3 to -0.6 ‰, whereas terrestrial and suspended sediments range from -4.6 to +4.3 ‰ and -4.7 to +7.7 ‰, respectively.

The low δ^7Li and high [Li] in the main streams indicate little modern fractionation of dissolved lithium into weathering products (e.g. clay minerals). Only in the steep terrain of the southern catchment formation of secondary minerals are locally indicated by high δ^7Li values and low [Li]. The δ^7Li of the main basin is consistent with simple mixing of lithium from the major streams. But higher δ^7Li values of the smaller western basins require some lithium isotope fractionation in the lake. The high evaporation rates may provide conditions allowing for some interaction of dissolved Li with secondary minerals and formation of chlorite (?). The low δ^7Li values of most local sediments provide evidence for intense chemical weathering in the catchment. The latter is probably a consequence of the arid climate with little vegetation and soil formation rates and the basin like topography leading to low chemical weathering rates combined with very long sediment residence times (i.e. low physical erosion rates).